REMARKS

The Examiner is thanked for the careful review of the application as set forth in the outstanding office action. Reconsideration of the application in view of the foregoing amendments and the following discussion is respectfully requested.

Claims 7-13 and 15-25 have been withdrawn from consideration. Claims 21-25 have been canceled herein. Claims 1-6 and 14 have been rejected.

Claim Rejections - 35 USC 103

Claims 1-3 stand rejected as being unpatentable over Maza et al. ("Maza") in view of Wickham et al. ("Wickham").

Claims 5-6 stand rejected as being unpatentable over Maza in view of Wickham and Scheuer.

Claim 4 stands rejected as being unpatentable over Maza in view of Wickham and Sievert et al. ("Sievert").

A ground of rejection of Claim 14 is not explicitly set out in the office action. However, since Claim 14 is discussed at page 3 of the office action, applicants will assume for purposes of this response that Claim 14 is rejected on the same grounds as Claim 1.

The rejections are respectfully traversed, on the grounds that a prima facie case of obviousness has not been established, and the applied references do not teach or suggest the claimed subject matter.

Claims 1-3 and 14:

Claim 1 is drawn to a method of calibrating an optical sensor of a color image forming device, "said image forming device including a traversing carriage supporting said optical sensor and a plurality of different color ink printheads, the traversing carriage movable over a print area during normal printing operations

and over a service area of the image forming device for service operations, the method comprising:

positioning a prefabricated optical sensor target at the service area of the image forming device, the target including a plurality of target patches of predetermined different colors, and wherein the plurality of target patches have not been produced by said plurality of different color ink printheads or said color image forming device;

moving the carriage to the service area of the image forming device;

acquiring one or more images of said plurality of target patches;

using the one or more images to perform a plurality of calibrations of the optical sensor."

The Examiner alleges that Maza discloses the subject matter of Claim 1, except Maza fails to teach performing more than one type of calibrations of the optical sensor. For example, the office action alleges that Maza describes using "the one or more images to perform a calibration of the optical sensor (e.g., determination of the operation of optical sensor 17 in correctly reading the test pattern)(col. 7, lines 47-48)."

Applicants respectfully disagree with the allegations regarding the teachings of Maza. Maza is concerned with "the positioning of inkjet cartridges held in the printer carriage of an inkjet printer relative to a service station of the printer for performing servicing functions on the cartridges." (1:24-27) Maza describes a method which "utilizes an optical sensor mounted on the printer carriage to scan a reference mark within the service area. Preferably the reference mark exhibits a change in reflectance in the scanning direction of the printer carriage and is mounted on a service station carriage which also holds removable service modules." In contrast, Claim 1 is drawn to a method of calibrating an optical sensor of a color image forming device.

Maza describes at 7:21-54 and at FIG. 16 a procedure for determining the y position of the turning point 80 of the central dip in the curve representing a plot of the sensor readings as a function of the Y position of the carriage, which dip

corresponds to the center point of the reference mark (see 7:8-14). The procedure includes a:

> "check (step 102) is then performed on the differential function to ensure that this set of readings are valid. The maximum 84 and minimum 85 of the differential function s3(y) are found and the difference between these figures is compared to an empirically determined value minGap. If the difference is greater than minGap, procedure A1 is continued, if not the sensor readings are discarded and the procedure is restarted. If this check is repeatedly failed, an error message is given to the operator. Since the maximum and minimum values correspond to the edges of the reference mark, this check should ensure that there is a reference mark mounted on the service station carriage 24, that it is has been correctly positioned for calibration and that the reference mark has been correctly "read" by the optical sensor."

Applicants respectfully disagree with the Examiner's interpretation that the check at 102 of FIG. 16 represents a calibration of the optical sensor. Failure of the check 102 may mean that there is no reference mark mounted on the carriage 24, or that the carriage has not been positioned for calibration, or that the reference mark has not been correctly read by the optical sensor. There is no calibration of the optical sensor by check 102. The Examiner is referred to definitions of "calibrate" in Webster's Online Dictionary, "to standardize (as a measuring instrument) by determining the deviation from a standard so as to ascertain the proper correction factors," or "to adjust precisely for a particular function." Check 102 does not perform a calibration of the optical sensor. For this reason alone, a prima facie case of obviousness has not been established.

The Examiner agrees that Maza fails to teach performing more than one type of calibration of the optical sensor. Wickham is cited as allegedly disclosing an image forming apparatus with a plurality of cartridges that emit a variety of colored ink droplets, an optical sensor in the form of a sensor array (CCD 100) used for creating an ink color transforms to enable optimized printing operations, "wherein a plurality of calibrations of the sensor array are initially performed to (a)

ensure that the sensor array is operating effectively, (b) determine and/or confirm the operational range of the sensor array by reading the adjacent black and white patterns, and c) deriving the ratio of the CCD array pixels to each printer pixel (co. 10, line 41 to col. 11, line 47). The Examiner further alleges that Wickham further teaches using the sensor array to perform color calibration by building a color transform from a plurality of color patches so as to apply the color transform to a digital image data stream during the printing operations. Further, the Examiner alleges that it would have been obvious to modify the device of Maza to incorporate the various calibration types as taught by Wickham, and that the motivation for doing so would have been to allow the optical sensor to perform a high calibration process so as to enable optimized printing operations as suggested by Wickham. Applicants respectfully disagree with the alleged teachings of Wickham and that a motivation exists to modify Maza in the manner suggested by the Examiner.

Wickham teaches that sets of calibration patterns printed by the plurality of printing heads 43 (see, e.g. 9:14-34) are used in an initial calibration of the optical sensor 100 (10:41 et seq.). Thus, Wickham teaches away from subject matter of Claim 1, e.g. "positioning a prefabricated optical sensor target at the service area of the image forming device, the target including a plurality of target patches of predetermined different colors, and wherein the plurality of target patches have not been produced by said plurality of different color ink printheads or said color image forming device."

Even assuming arguendo that one modifies Maza with teachings of Wickham, at most this would result in a technique which employs calibration patterns printed by the Maza printing device, and not a prefabricated optical sensor target as recited in Claim 1. Wickham uses the patterns printed by the printing heads 43 for various purposes including testing the printheads, and so Wickham teaching away from using a prefabricated target as recited in Claim 1.

In view of this, a prima facie case of obviousness has not been established, and the rejection of Claim 1 should be withdrawn.

Claims 2-3 depend from Claim 1, and are also in condition for allowance. Further, these claims add distinguishing limitations. Claim 2 depends from Claim 1, and recites that "said plurality of target patches includes a white patch and a black patch, and wherein said plurality of calibrations includes sensor pixel response uniformity and dynamic range." The office action does not explicitly address the limitations of Claim 2, and so for that reason alone a prima facie case of obviousness of Claim 2 has not been established.

Claim 14:

Claim 14 is drawn to a method of measuring a reference position of a carriage mounted sensor array for an image forming device, said image forming device including a traversing carriage supporting an optical sensor and at least one printhead, the optical sensor including a sensor array having a longitudinal extent, the traversing carriage movable over a print area during normal printing operations and over a service area of the image forming device for service operations, the method comprising:

moving the carriage to the service area;

generating a light beam from a carriage-mounted light source at a position adjacent an end of the sensor array, the light beam at an acute angle relative to an array axis;

reflecting the beam from a reference target mounted in the service area at a known position onto the sensor array;

acquiring an image of the reflected beam by the sensor array; and

using the location of a high intensity area of the image along the longitudinal extent of the sensor array to determine said reference position of the optical sensor, wherein said reference position is a reference spacing distance of the sensor array from the reference target.

The foregoing amendments to Claim 14 have mooted the rejection of Claim 14, and are fully supported by applicants' specification e.g. at FIGS. 9 and 10A-10C, and paragraphs 63-64. The applied references do not teach or suggest determining a reference position of the sensor array relative to the target which

is a reference spacing distance of the sensor array from the reference target. Maza describes sensing the position of the print head carriage along its travel axis be sensing the mark on the service station. Maza does not describe sensing a reference position which is a spacing distance of the sensor array from a target.

The rejection of Claim 14 should be withdrawn.

Claim 4:

Claim 4 stands rejected as being unpatentable over Maza in view of Wickham and Sievert. Claim 4 depends from Claim 1, and is allowable for the reasons discussed above regarding Claim 1.

The Examiner agrees that neither Maza nor Wickham disclose the target including a plurality of spaced fiducial marks, and that the plurality of calibrations includes determining an angular position of the target relative to the sensor. The office action alleges that Sievert discloses a method for determining a positional deviation of the printheads, and that it would have been obvious to provide the target pattern in the modified device of Maza as diagonal stripes as taught by Sievert for the purpose of determining the positional deviation of the print heads in both main and sub-scanning directions.

The foregoing allegations do not meet the claim limitations of Claim 4, e.g., that the plurality of calibrations include determining an angular position of the target relative to the sensor. Sievert is not concerning with determining an angular position of a target relative to a sensor, and so the applied rejection does not meet the claim limitations. This is a further reason a prima facie case of obviousness has not been established.

Claims 5-6:

These claims stand rejected as being unpatentable over Maza in view of Wickham and Scheuer. These claims depend directly or indirectly from Claim 1, and are allowable for the reasons given above regarding Claim 1.

New Claims

New Claim 26 depends from Claim 1, and further recites that "said prefabricated optical sensor target is a target printed by an offset printing process." This limitation is supported by applicants' specification, e.g. at paragraph 50.

New Claim 27 depends from Claim 14, and further recites that "said generating a light beam from a carriage-mounted light source comprises generating a focused light beam from a light emitting diode (LED) light source." This limitation is fully supported by applicants' specification, e.g. at paragraph 63.

These claims are also in condition from allowance, since they depend from allowable claims, and add further distinguishing limitations.

CONCLUSION

The outstanding rejections have been addressed, and the application is in condition for allowance. Such favorable reconsideration is solicited.

Respectfully submitted,

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